A CRITIQUE OF THE VARIOUS ASPECTS OF MANAGERIAL ECONOMICS

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CAPITAL BUDGETING

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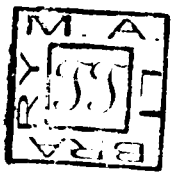

C O N T E N T S

C A P I T A L B U D G E T I N G

Capital budgeting is one of the most important branches of managerial economics. It is also known as equipment replacement policy, investment decision making or the analysis of capital expenditure. Capital budgeting may be defined as "long term planning for making and financing proposed capital outlays."[1] It is "in essence, an application of a classic proposition from the economic theory of the firm; namely, a firm should operate at the point where its marginal revenue is just equal to its marginal cost. When this rule is applied to the capital budgeting decision, marginal revenue is taken to be the percentage rate of return on investments, and marginal cost is the firm's percentage cost of capital."[2] Capital budgeting decisions are long-term investment decisions. They involve commitments of capital to specific projects or assets for long-periods of time. Such decisions once made and implemented cannot be reversed easily without major loss of capital. This never means that these decisions are irreversible; but it simply means that their implications are far more extensive than those of short-run decisions.

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1. Horngren, Charles T. Op. cit., p. 440.
2. Brigham, Eugene F. and Pappas, James L., Op. Cit. p. 393.

The time factor is a crucial factor which necessitates analysis by techniques different from those needed for short term decisions. The time factor requires financial planning into the fairly distant future and necessitates capital expenditures that can be recovered only over a period of many years. Because of this time element capital budgeting decisions are subject to a greater degree of risk and uncertainty than most short-term financing decisions. These long-term investment decisions must, therefore, be based upon sound budgeting procedures.

W.W. Haynes recognises six steps in investment decision making. They are:[3] (1) The search for opportunities of new investment; (2) A forecast of the variations in cash flows that will emerge from each investment opportunity; (3) A method of computing the cost of capital which will take into consideration the availability of funds; (4) A method of converting the changes in the expected cash flows into a common unit that will reflect the discounting principle; (5) The selection of the most profitable investment or combination of investments; and (6) A post-audit of the results of previous investments. Every budgeting decision essentially needs four elements. The first necessary element for a good decision is a clear idea

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3. Haynes, W.W., Note and Paul, Op. cit. p. 602.

of what the problem is. The second requirement is a good set of alternatives among which one can make choice. The third pre-requisite for a good budgeting decision is an accurate set of estimates of the likely outcomes of the alternatives and the fourth essential element of the decision process is the evaluation and comparision of the alternatives in the light of their revenue and expenditure consequences. The nature of the budgeting problem, therefore, can be posed by asking three basic questions:[4] (1) How much money will be needed for expenditures in the coming period? (2) How much money will be available at what cost? and (3) How should the available money be distributed amongst various projects. The first question deals with the demand for capital and since the aim of capital expenditures is to make profits, this problem involves a survey of profitable opportunities of investments on the basis of their yields. The second question concerns supply of capital. A supply side has three aspects: (a) How much can we raise internally from depreciation and retained earnings? (b) How much we can procure from outside agencies? and (c) What shall be the cost of capital. The third question relating to rationing of funds is the crux of the budgeting problem where it becomes evident how much should be spent in all and where?

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4. Dean Joel, Op. cit. p. 355.

These questions have been answered in the following sections.

Demand for Capital

The analogy of demand and supply can be adopted to the problem of capital budgeting. The arrangement of various proposed projects in descending order according to their estimated rate of return, together with the dollar amounts of capital needed by the respective projects constitutes the demand schedule for capital. In a tabular form it shows the relationship between yield and cumulative totals of proposals. In other words when the firm's investment proposals are arrayed in a ladder of return of investment and cumulated, they form the demand schedule for capital. They show "how much money can be invested at rates of return that will be better than the specified series." In order to develop a company's demand schedule for capital, four steps are necessary. First of all we should calculate all the individual needs for capital expenditures that can be discovered and foreseen, then we should estimate for each proposal its prospective yield in the form of rate of return on the investment. Having done this we should arrange the projects in ascending order according to the rate of return and finally we should cumulate this ladder in the form of a schedule stating the amount of capital that can be invested to equal or better each of a series of rates of return.

The proposals dealing with asset acquisitions are usually grouped into: (a) replacement; (b) expansion in existing product lines; (c) expansion in new product lines and others. Replacement decisions are quite simple. Assets depreciate and become obsolete, they must be replaced to continue production. The firm can predict the outcomes of the replacement decisions with a high degree of certainty because it knows the savings in cost obtained by replacing an old asset. Second types of decisions pertaining to additions of more machines of the same kind or the opening of another branch in city wide change, have some degree of uncertainty, they are, however, not so complex because the firm has at least some advantage of examining past production and sale experience with similar situations. The investment decisions of the third and the fourth kind are difficult. The firm has little experience since most of these investment decisions lack information on which to base the opinion and most of the others are intangibles.

Before analysing the investments the management must understand the nature of these various opportunities. "Some investments are complementary; making one investment either necessitates or, atleast, suggest another. Other investments are mutually exclusive; acceptance of one necessarily involves rejection of the others, finally, some investments

are independent." Those types of investments must be identified before these various opportunities are evaluated as alternatives. If two or more investments are treated as complementary, they should be combined and analysed as a single proposal in comparison to the alternative independent investments. If they are mutually exclusive, a selection should be made between them before they are treated as alternatives to other independent investments. Once complementary investments are paired and mutually exclusive alternatives are eliminated, the problem becomes easier because the management is faced only with an array of independent alternatives. At this stage alternative investments can be ranked according to their relative profitabilities. Management could then select investments in declining order of profitability until the available capital is exhausted.

It is also useful to distinguish between cost reduction investments and revenue increasing investments. The former deal with the expenses which would have been paid without the investment but which are escaped as a result of the introduction of the new investment. An example would be the introduction of a new machine in place of the old one. The later consist of changes in revenues and changes in costs such as the expansion of plants and equipments etc. Many investment projects may combine both, namely, elements

of cost deduction as well as revenue increase. These decisions are govern by the incremental reasoning. An investment decision is profitable if it adds more to revenue than to costs or it decreases some costs more than it increases others or it increases some revenues more than it diminishes others or finally it reduces costs more than revenue.[5]

The critical element in the analysis of demand for capital is the productivity of the proposed capital outlays. The care and precision with which the estimates of capital productivity are made, are likely to make the difference between good and bad decisions. Joel Dean has suggested several general principles for evaluating capital productivity. He gives primary importance to the recognition of the sources of earnings. The most significant direct sources are either cost savings or sales expansion. Cost savings are pertinent in matters of replacement and modernization of equipment while investments that involve new products or expansion of capacity to produce old ones are the investments that concern sales expansion. To be precise yield must be calculated in terms of individual project. It is the expected productivity of a marginal unit of capital that is the key factor in the appraisal of

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5. Haynes, W.W., Mote and Paul, Op. cit. p. 15.

allocating capital funds and not the profitability of the old and sunk investment based on historical cost estimates. Past is useful only as a guide to the future. It is the future profit on marginal investment based on estimates of expected prices, expected costs etc., that is more relevant. As far as possible the estimates of capital productivity should involve comparison of future costs and profits with the relevant alternative. It is the opportunity cost of the alternative that is most pertinent in the sphere of estimating capital productivity. The kind of cost comparisons that are valid usually differ according to the nature of the alternative. The capital yield should be calculated over the whole life of the asset. Although, the estimates of economic life are mostly inexact, they are, however, necessary for measuring capital wastage cost. The life period of an asset should not be established by an arbitrary decree of management. Selecting the wrong life-period can be serious: it can reverse the conclusion. This occurs when management selects a fixed payout period for all equipment irrespective of their nature.

Discounting the expected rate of return so as to take into consideration, the diminishing value of distant earnings, is an integral part of capital theory. Discounting principles is similar to the saying that a dollar tomorrow is worthless than a dollar today or a bird in the hand is

worth two in the bush. This analogy might appear misleading, it is, however, fundamental in calculating future inflows. "If a decision affects costs and revenues at future dates, it is necessary to discount those costs and revenues to present values before a valid comparison of alternatives is possible." The concept has a practical importance when there are distinctive time patterns of the income streams of different assets and when the rate of discount is quite significant. The amount of capital outlay to be utilised for comparison with earnings should be based on an estimate of the average amount invested, rather than the initial capital outlay. In view of several complexities, the conventional straight-line depreciation account may equally be as good an estimate as any of capital payback. Estimates of indirect earnings usually involve a high degree of judgment and possess wide error margins. The estimates of earning whether from savings of cost or from incremental profits should take into consideration the indirect effects of the proposed outlays upon the working of existing facilities. In a competitive economy the capital expenditures create abnormal profits in earlier stages but there is a tendency for capital expenditures to destroy the abnormal profits by destroying the economic opportunity that creates them. High profits are the indicators of

greater opportunities for greater investment but expenditures flow with a greater speed until increasing costs or output tend to cause firms to overstretch their optimum levels, resulting in the destruction of super-normal profits. This risk of destruction should, therefore, be examined in connection with each profitability estimate. It is an established fact that investment opportunities differ in respect of riskiness. The riskiness of an asset is defined in terms of the likely variability of yields from the asset. The more variable the expected outcome of a decision, the riskier is the decision. Any investment decision implies a forecast of future happenings which are certainly surrounded by a blanket of uncertainty and mystry. Risk is thus a difficult concept to grasp and a great deal of controversy surrounds it. Hence estimates of the productivity of capital outlays should be analysed systematically allowing for difference in inherent riskiness of the projects and the width of error margins. Finally, the capital productivity should be measured only when there exists a factual foundation for estimates. Those investments whose returns are too low to warrant estimates or are so apparant that their estimation is an academic exercise or are so difused and conjectural that they defy quantification, should not be considered seriously.

The Search for Investment Opportunities

The fundamental concept in budgeting is the alternative. The term alternative refers to any distinct course of action that the firm may choose at the time of decision making. At any time the firm has a set of alternatives that it is considering and from which it wants to make a choice. The set may include possible choices with regard to a single variable or with regard to a complex set of alternatives. The decision criterion that came to the mind of the classical economists was profit. intutively profit seems to be the amount of revenue left over after all costs have been met but such a simple profit criterion does not suffice because profits have been defined and computed in several ways. To overcome this difficulty the concept of "contribution to profit" was developed. But the contribution-to-profit concept itself has shortcomings. Many writers, however, assume that the basic aim of a long term investment decision is to maximize long term profits. The investment decisions of the firm, therefore, must rest on the most profitable employment of the capital available to such firms. Management is faced with a variety of alternatives many of which appear profitable. Frequently the expected profitability of the projects exceed the capital available for investment. Management, therefore,

has to select those opportunities that are most profitable. It is not sufficient to pin-point profitable opportunities. They must also be ranked according to their potential yields. Those investments that are likely to yield a rate of return in excess of the cost of capital are treated potentially profitable. In theory a firm should be able to acquire capital as long as it can invest it to yield more than its cost. In practice most firms are not so fortunate, they regard their available capital as more limited than what the theorists believe. Capital budgeting is essentially the analytical process of allocating the scarce capital available to a firm to the most profitable uses. Every executive, therefore, has basically two roles. His first role is to discover the alternatives and the second role is to improve them so that the firm can maintain or improve its profitability. The organizational structure should be so designed that it stimulates the discovery of new alternatives and minimises obstacles to the search for investment opportunities.

Methods of Evaluating Investments

One of the most significant aspects of budgeting is the measurement of "investment worth." It requires a common denominator to compare and rank investment

opportunities to which all investment impacts can be converted. The various methods for appraising the relative worth of the alternative investment projects are: (1) The discounted cashflow method; (2) Accounting method or Net present value method; (3) The MAPI method; and (4) Payback method.

The Discounted Rate of Return Method

For a layman the rate of return on investment is the ratio of annual receipts to original cost. This concept is approximately correct; it is precisely correct for permanent, non-depreciating, non-appreciating asset, producing a uniform income stream periodically over a length of time. In actual practice it is hardly possible to forecast the precise liquidating value of an investment until the asset's actual liquidation value is known. Besides this it is rarely possible to have a constant flow of income stream periodically; investments usually produce different quantums of incomes at different level of time. True rate of return is generally found out by taking into account liquidation value of the assets as well as the income stream produced by such assets. For many practical purposes we want to estimate the rate of return in order to know the profitability of investment before rather than after the investment is made. In order to understand the

rate of return, we should appreciate the time value of money. "By this is meant that dollars at different points in time cannot be made directly comparable. Unless they are first expressed in terms of a common denominator. The common denominator which is used is the interest rate."[6] For example, if a sum of money is invested at 10 per cent interest, then in that case a dollar today is not the same thing as a dollar next year because a dollar today can be invested so that it is worth dollar 1.10 next year. Similarly dollar 1.10 next year is not equivalent to dollar 1.10 in the following year because if dollar 1.10 is invested next year at 10 per cent, its worth would be dollar 1.10 + 10 per cent of that sum or a total of dollar 1.21 in the following year. This process of compounding can be extended to any limit. Further we can equate a given sum of money at the present time with another amount of money at at future date by the same process. Thus the sum of dollar 1.00 today at 10 per cent interest is equivalent to dollar 1.10 next year or dollar 1.21 after two years at 10 per cent interest is equal to dollar 1 today. By compounding we move from present to future while by discounting we move from future to the present. The explanation of discounted rate of return is cumbersome. It is the rate of discount which when applied to the expected

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6. Spencer, Milton H. Op. cit. p. 387.

cashflows in future, it equates their sum tothe supply price of the capital. The formula for the discounted rate of return is as under:

$$C = \frac{F_1}{(1+r)} + \frac{F_2}{(1+r)^2} + \cdots\cdots + \frac{F_n}{(1+r)^n} + \frac{S}{(1+r)^n}$$

where

C = the supply price of the asset

F's = the future cash inflows

S = the salvage value of the asset in year n, and

r = the discounted rate of return.

After the computation of the discounted rate of return it is necessary to compare the cost of capital. If the discounted rate of return is greater than the prevailing market rate of interest, the investment is desirable for its discounted return exceeds the opportunity cost of capital. Thus the discounted cashflow method recognizes that the use of money has a cost. Because this method explicitly and routinely weights the time value of money, it is the best to be utilised for long range decisions. Another significant aspect of this method is that it focuses on cash inflows and outflows rather than on net income. Since this method can not be understood just by the formula, we are explaining it by giving an example.

Example: A firm is considering the purchase of the new machine which will have eight-year useful life, have zero salvage value, and result in cashinflows of $ 2,000 annually. If the machine will cost $ 9,936 now, what is the discounted rate of return on this project?

Solution:

Original Investment	$ 9,936
Useful Life	8 years
Annual Cashinflows from the Project	$ 2,000
Rate of Return	12 per cent

PROOF:

Discounting Procedure for each Years Cashinflow Separately

End of Year	Annual Cash Inflows ($)	Present Value of $ 1 discounted at 12 per cent ($)	Total Present Value ($)
1	2,000	0.893	1,786
2	2,000	0.797	1,594
3	2,000	0.712	1,425
4	2,000	0.636	1,272
5	2,000	0.567	1,134
6	2,000	0.507	1,014
7	2,000	0.452	904
8	2,000	0.404	808
Present Value of Future Inflows			9,936
Initial Outlay			9,936
Net Gain			0.00

The zero difference proves that the rate of return is 12 per cent. The discounted rate of return, therefore, can be defined as "the maximum rate of interest that could be paid for the capital employed over the life of an investment without loss on the project."[7] The above example reveals that $ 9,936 is the present value at a rate of return of 12 per cent of eight-year stream of inflows of $ 2,000 in cash per year. Twelve per cent is the rate that equates the amount invested ($ 9,936) with the present value of the cashinflows ($ 2,000 per year for eight years). In other words if a sum of dollar 9,936 were borrowed at an effective interest rate of 12 per cent, the cashinflow produced by the project would exactly repay the loan plus interest over eight years. If the prevailing rate of interest or the minimum desired rate of return is less than 12 per cent the project will be feasible. If the cost of capital exceeds 12 per cent, the cashinflow obtained by the use of capital will be insufficient to pay interest as well as to repay the principal of the loan. Twelve per cent is therefore the discounted rate of return for the project.

Net Present Value Method

Another variant of discounted cash flow approach may be called the net present value method. The concept of

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7. Horngren, Charles T. Cost Accounting - A Managerial Emphasis (Englewood Cliffs, Prentice-Hall, 1962) p. 444.

present value is based on the fact that a dollar in the hand today is worth more than a dollar to be received few years from today. In interim period a dollar can be invested and would grow markedly during the span because of the interest it would earn. The total present value of cash inflows generating out of an investment can be written as under:

$$V = \frac{F_1}{1+i} + \frac{F_2}{(1+i)^2} + \cdots\cdots + \frac{F_n}{(1+i)^n} + \frac{S}{(1+i)^n}$$

where

V = present value

i = the rate of interest or the cost of capital

F's = the future cashinflows, and

S = the salvage value of the asset in year n.

Since computing the exact discounted rate of return entails trial and error, the net present value method assumes some minimum desired rate of interest or return. All future cash inflows are discounted to the present by using this rate as the minimum rate. If the net discounted value is positive the project is profitable because its yield exceeds the desired minimum. If the result is negative, the project is unprofitable. The previous example can also be used to demonstrate the net present value method.

Solution:

Original Investment	$ 9,936
Useful Life	8 years
Annual Cash Inflow from the Project	$ 2,000
Minimum Desired Rate of Return	10 per cent

Discounting Procedure for Each Year's Cash Inflow Separately

End of Year	Annual Cash Inflows ($)	Present Value of $ 1 Discounted at 10 per cent ($)	Total Present Value ($)
1	2,000	0.909	1,818
2	2,000	0.826	1,652
3	2,000	0.751	1,502
4	2,000	0.683	1,266
5	2,000	0.621	1,242
6	2,000	0.564	1,128
7	2,000	0.513	1,026
8	2,000	0.467	934
Present Value of Future Inflows			10,568
Initial Outlay			9,936
Net Present Value			632

The above example shows that the new machine which costs $ 9,936 will earn a net present value of $ 632. The manager would be able to invest $ 632 more, or a total of $ 10,568 and still earn 10 per cent on the project. The investment is, therefore, profitable from the point of view

of management. The net present value method is more useful than the time-adjusted rate of return. The former does not entail scovering tables and solving for the real rate of return by trial and error. Fourth, its rational is much easier to understand and it can be applied to any situation regardless of whether the cash inflow is even or uneven.

Accounting Method of Rate of Return

Accounting method is known by several names such as financial statement method, the book value method, the rate of return on asset method, the approximate rate of return method, and the unadjusted rate of return method. This technique is conceptually inferior to discounted cashflow methods, many managers use it because they feel that the use of this method is adequate for guiding their decisions. The equations for the accounting rate of return are:[8]

$$\text{Accounting Rate of Return} = \frac{\text{Increase in Future Average Annual Net Income}}{\text{Initial Increase in Required Investment}}$$

$$R = \frac{O_t - W - S}{I}$$

where

R = average annual rate of return on initial incremental investment,

O_t = average annual incremental cash inflow,

W = average annual write-off of incremental investment,

S = average annual incremental effects of salvage values.

8. Horngren, Charles T. Op. cit. p. 463.

Assume that $ 5,000 is spent for a machine which has an estimated useful life of 10 years; estimated salvage value zero; and expected annual cashflow from operations $ 1,000. By substituting these amounts we get:

$$R = \frac{\$\ 1,000 - \$\ 500 - 0}{\$\ 5,000} = 10\%$$

Many managers would not use $ 5,000 in the denominator. Instead they will use $ 2,500, half of the original investment that is the average amount invested in the machine over its life time. Under this approach the accounting rate of return would obviously be doubled as shown under:

$$R = \frac{\$\ 1,000 - \$\ 5,00 - 0}{\$\ 2,500} = 20\%$$

Practice is not uniform as to whether initial investments or average investments should be used in denominator. Many business executives defend the use of initial investment base because it remains constant over the life of the investment and facilitates the comparison between the actual rate of return and predicted rate of return. The initial investment, however, should include all additional required current assets, fixed assets, research expenses, cost of sales, promotion etc. This

method has several deficiencies. Since it is based on annual average it ignores the time value of money. Further, its answer is directly influenced by decisions concerning depreciation, capitalisation-versus-expense decisions. Erratic flows of revenue and expense are not directly considered but are averaged. The method utilises concepts of capital and income which were designed for quite different purposes. Thus accounting method is less scientific and is based on subjective rather than objective considerations.

Payback Method

Although the rate of return formulation and the cost of capital method provide theoretically correct answer to solve the problem of selecting economically worthwhile investments, they are not in much use in business. Businessmen find it difficult to comprehend the basic theoretical and conceptual subtleties of these formulas. Consequently they fall back on a number of short-cut devices or rule of thumb techniques, none of which yield the correct answer. They almost provide only a rough approximation. Many small business firms rely on subjective evaluations of the alternatives. They are convinced that being in close touch to the situation, they can determine which investments are profitable and which are not. Many

a times the subjective evaluations of these businessmen prove reasonably correct but the difficulty with these non quantitative approaches is that the hunches or guesses on which these calculations are made often do not coincide with the realities. Businessmen frequently employ a short-cut quantitative approach to investment decisions involving allocation of capital funds by estimating the length of time required for the cash earnings to return to the original cost. This method is called the payout, pay-off or payback method. The payback period is the time needed to a firm to recover the initial investment out of the earnings resulting from such investment. The formula for the payback period is P = I/E, where

P = the pay-back period

I = the original price of the investment, and

E = the annual cash inflow expected from the investment.

If an investment costs $ 9,000 and results in a cash inflow of $ 3,000 per annum, the payback period would be 3 years. It is, therefore, clear that given the life of the project, profitability will change inversely with the payback period or that given the payback period, profitability will change directly with the life of the project. Although payback method is a rough and ready method

for calculating the profitability of the investment, it is looked upon with disdain by theorists. The payback often yields clues to profitability but it should be noted that it does not measure profitability it simply shows how quickly investment dollars may be recouped. A businessman is primarily interested in the profitability and not in recapturing the original investment. The major weakness of the payback approach is, therefore, its neglect of profitability. The mere fact that a project has shorter payback does not mean that it should be selected in comparison to an alternative project with a longer payback period. The formula implicitly assumes a uniform cash inflow over the life span of the asset. The tool is often too blunt to be utilized in selecting among various alternative projects which differ as to payout, cost and productive life. Its most obvious limitation is that it fails to take into account profits earned after the initial investment has been recouped. Further, it ignores discounting altogether and lastly, it involves a simplification which is far from being real.

Although the payout concept does not yield an estimate of the rate of return, the method can be adopted as a device for approximating the rate of return with the help of the following formula:

$$r = \frac{u}{1} - \frac{u}{1} \left(\frac{1}{1 + r}\right)^n$$

where u represents the uniform annual cash inflow, I denotes investment outlay and $\frac{u}{I}$ signifies the reciprocal of the payout period. The formula states that "the rate of return is the difference between the reciprocal of the payout period and some quantity equal to the product of the payout reciprocal and $\left(\frac{1}{1+r}\right)^{n}$." It is immediately clear that for large values of n, the rate of return will be approximated by the value of the payout reciprocal. Thus it is interesting to note that a rule of thumb method employed by businessmen for several years has turned out to be a reasonably good approximation of the theoretically correct measure. The reputation of this method which had suffered a lot has recently enjoyed a good recovery.

The MAPI Method

George Terborgh, the chief economist with the Machinery Allied Products Institute has produced a convenient formula for evaluating investment decision which is widely used by firms. It aims to produce the next-year rate of return which is defined as the return we get from an investment in new project if we make it now, rather than wait for one more year. This figure helps businessman in finding out the time when the return from a capital outlay is greater than the cost of the funds, the firm will have to use, than the return that the firm usually seeks from its investments or the returns available from other

investment opportunities. Terborgh's next-year rate of return is similar to the discounted cashflow rate of return with a difference that Terborgh obtains his rate of return for the whole life of the project by a standardized way of estimating the capital consumption cost of the new project while DCF method builds a complete projection of the cost of the new project during its entire anticipated useful life.

The firm that intends to use MAPI's technique has to sort out five different factors to find out next year rate of return. First of all the researcher must find out the operating advantage to be gained from the new equipment. The sum total of the savings effected in direct labour costs, maintenance expenses, tools and supplies, floor space etc., constitutes the project's operating advantage. The analyst then should find out the magnitude of the capital consumption avoided: if the proposed project is delayed for a year, the old equipment may need some repair. Moreover, there will be some drop in the old equipment's disposal value. Since the introduction of the new project avoids these costs it amounts to saving in capital consumption and is equivalent to new investment. Thirdly, as there would be added income tax, this amount should be substracted from

the gains represented in formulas first two factors. The cost of consuming the capital that is to be spent on the new investment is the tough part of the technique. Terborgh and his colleagues have produced a set of standardized charts from which one can easily find out approximate cost of the projects first year capital consumption. The last stage of the MAPI formula is the net investment in the project. In order to work out this amount we should deduct the money we get from salvage and the money we would have had to spent to keep the project going from the total cost of buying and installing the new equipment. MAPI formula does not belong to 'shortcut category', it is a method based on highly sophisticated reasoning and in a form that makes its application extremely simple.

These methods provide charts from which the return can be observed easily, once the preliminary calculations are made. These charts are based on average patterns of cashflow that are typical for most situations. These methods have gained wide popularity because of simplicity and reasonable accuracy. Being mass-produced methods they often prove satisfactory for many practical situations involving equipment invectment decisions.

First Year Performance Method

Many firms evaluate the project's opportunities by estimating its impact on costs and revenues in the first year. If the marginal revenue generated from additional sales or the savings in costs resulting from the new equipment exceeds all of the additional expenses including interest and depreciation, the projects may be accepted. In this approach depreciation is included as an expense. Few even charge interest on the funds tide-up in the investment or atleast on the average investment. The method is no doubt inadequate, however, it may be compared with the payback reciprocal. Payback reciprocal might also start with first year performance by computing the rate as a percentage of initial investment, but does not involve a deduction for depreciation or interest. There are various variants of this formula which take into consideration the annual post tax cash inflow minus depreciation as a percentage of annual depreciation. Other prefer to use the average cash inflow over the life of the asset to the first year perfo- though often the first year is taken to be representative of the whole life of the asset.[9]

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9. Haynes, W.W. Op. Cit. p. 618.

Nomographs Method

A nomograph or nomogram is a graph that helps us with the aid of straightedge to understand the value of a dependent variable when the values of other independent variables are given. By using such a graph, calculations can be made quickly with a minimum of time and effort. Nomographic devices have been developed to facilitate the rate of return and similar types of calculations. The graph is based on the following formula:

$$\text{Percent Return on Investment} = \frac{\text{Annual Gross Return} - \text{Annual Depreciation}}{\text{Gross Capital Investment} - \text{one-half of Annual Depreciation}}$$

These graphs do not taken into consideration increased working capital needs or for special expenses which result from the project. They are to be anticipated and treated as part of the equipment cost in order a reliable estimate of the rate of return. Nomographs facilitate various kinds of capital budgeting problems. However, they can no be used for all types of calculations especially those that need judgmental considerations.

Postponability Criterion

Another widely held practice for selecting among investment opportunities is postponability, that is how

long the project can be postponed. This method of choosing investment is not sound and is not likely to give better results. However, whenever there is an excess of budget request over available funds many firms utilise postponability as a dominent criteria to regard those projects that can be put off. Normally low profit items fall under the category of postponable class. "Must" items are generally high profit items hence they are given preference in view of their relative productivity. The use of postponability criterion generally results in a stagnant situation. These standards tend to retard expansion of investment and technological advance.

Critical Appraisal of Various Methods

We have analysed various techniques for investment proposals - the discounted rate of return, the net present value method. MAPI technique, payback method and others. The first two of these methods are scientific, they both indicate the profitability of the project in the light of the cost of capital. For example, if the net present value of the cash inflows exceeds that of the cash outflows, after being discounted at the capital cost rate, the investment is considered profitable. Similarly the discounted rate of return is contrasted with the cost of

capital, if the rate of return is greater than the cost of capital, the investment is chosen. As against these two methods, the payback method and other short-cut devices are only a partial analytical techniques. They can, however, be used only as a supplementary analytical devices in conjuction with the scientific methods of analysis. Basing investment decisions purely on short-cuts would be dubious. One good thing with net present value method and the discounted rate of return method is that they recognize the time value of money, although they do it slightly differently. Both discount the expected cash inflow, but at different interest rate. The discounting mechanics of both is based on the assumption of the reinvestment of cash inflows. The net present value method assumes that all such inflows are to be reinvested as to provide a rate of return equal to the cost of the project. As against this the discounted rate of return assumes the same principle but at a rate equal to the rate of return on the investment under consideration. On pragmatic grounds the net present value method is more advantageous than the discounted rate of return because of its simplicity and practicability. The computation of the rate of return under discounted cashflows method requires

several trials before the correct rate is obtained. Each of these trials involves complicated calculations at different rates of interest. The net present value method, however, needs only one discounting of the cash inflows. In comparison to the discounted cash inflows method, the net present value concept is relatively new and has not gained popularity. Since it is pragmatic it is likely to become more familiar to business executives and probably will be much more widely used.

Supply of Capital

So far we have discussed various concepts and principles concerning the demand for capital funds. We now turn to supply of capital which deals with availability and cost of Capital. There are basically two sources of capital: internal and external. Depreciation charges, retained earnings and internal borrowings are the chief internal sources whereas issue of shares and debentures and intra-firm borrowings constitute the external sources of capital. In many firms capital expenditures are purely confined to the amount that can be secured internally. Thus the projection of the amount that can be expected from accumulated depreciation

and retained earnings is usually the most significant part of capital budgeting. The importance of retained earnings as a source of capital makes 'plough back' policy an integral part of capital budgeting. The basic problem concerning internal sources is: (a) to forecast as to how much cash will be accumulated internally; (b) to decide as to how much cash should be paid out in dividends; and (c) finally, to decide how much of the remaining amount be tied up in long-term projects.

External sources mainly depend upon the issue of shares, debentures and interfirm borrowing. These sources are much volatile. Much depends upon the capital market, company's reputation, financial backing and the integrity of the persons managing the affairs of the company. Whenever a company decides to acquire outside sources to finance its projects a basic factor that emerges as a significant determinant is the cost of capital, which "for common stock" is the ratio of prospective earnings per share to the selling price for new shares. The cost of capital is always an opportunity cost. It shows the return that can be obtained by diverting firm's funds into alternative market projects. Cost of capital may also be defined as that rate which

must be paid to obtain funds for the operation of the enterprise. Since the supply of capital comes from several sources, each source has to be analysed carefully to obtain the collective fund for purposes of capital expenditures. Because every source has a different cost, it is essential to calculate a weighted average cost of capital for the firm's entire capital structure.

The cost of capital is thus an important concept. It has received considerable attention in recent years and is one of the main pillars of capital theory. The cost of capital is essentially an academic term and the problem of measuring it in operational terms is a recent phenomenon. There are two schools of thought on this issue. One school believes that a firm's cost of capital is constant and is independ of the method and level of financing while the other advocates claim that it varies with the method and level of financing. Both the schools, however, believe in optimal policy which is meant as the policy that maximises the value of a company.

Before analysing the cost of capital it is necessary to examine the relevant concepts of capital. The current interest rate on long term debt is often called explicit cost or marginal cost of capital. It tends to rise as proportionate amount of debt in total

capitalisation increases. Firm's risk, flexibility and liverage characteristics are adversely affected with an increase in such capital. Consequently it implies a hidden cost. For purposes of decision making historical costs are irrelevant. It is the future cost that should be kept in mind. Distinction should also be made between the cost of a specific source of fund such as debt, equity, preference shares and inclusive cost of funds which reflects the amount of funds available to a firm from different sources at different prices. inclusive costs are relevant in most financial decisions. It is only in situations involving alternatives which do not effect the firm's capital structure that specific costs are utilized. Costs are also differentiated as spot-cost - those prevailing in the market at a certain point of time and normalised cost - those that reflect an estimate of cost from which cyclical element is removed by some averaging process. Spot costs are normally used in financing decision while the normalised cost are utilised in investment decisions.

There are various difficulties that arise in the way of measuring the cost of capital. Some authors suggest that the cost of capital should be defined as the earnings price ratio when the firm has an optimum capital structure

that balances debt and owner's equity in a way as to minimise the cost. But such an optimum is difficult to achieve in view of tax considerations and debt financing. Secondly, the determination of the expected earnings is highly conjectural, making it hard to calculate the relevant earnings-price ratio. Subjective considerations play a prominent role in determining such cost. Some people have a disliking for incurring debt, others favour trading on the equity by increasing the earnings on the existing stock through borrowing at rates below expected earnings. Still few others believe in the dilution of ownership and control that might result from the issue of more common stock. Lastly, the cost of capital is also affected by the firm's policy on retained earnings. Since retained earnings are not subject to personal income tax, they involve a lower cost of capital to the stockholders than dividends that are paid out and returned in the shape of the purchase of new shares.

There is a wide spread agreement about the meaning of the ratio of return but the same is not true in case of the cost of capital. The cost of retained earnings and the cost of new equity funds are difficult to measure. The problem becomes still more complicated when both debt and equity sources are tapped simultaneously. The

distinction between a borrowing rate and a lending rate has further created confusion in capital theory since these concepts have been used interchangeably as the firm's cost of capital. The confusion is further compounded by the fact that these rates themselves are complex. In reality there does not exist a single interest rate but a structure of such rates. Actually a separate interest rate exists for each class of claims depending upon maturity, issuer, nature and priority of right. Besides this there also exists a tremendous amount of equities on which no interest is paid but they find place in the interest rate structure by virtue of the dividends that are paid on them. The best way to measure cost is to look at the earnings yield on the stock since this is objectively measurable while other costs are subjective and defy measurement.

Hence, measurement of company's cost of capital is subject to various margins of error. It is not an exact procedure but is based on the forecast. Thus the computed values can be regarded as a fair approximation of the costs. Since more than one type of capital is used in a company, the total cost can be ascertained after the cost of each item is determined. We, therefore, shall proceed with the measurement of each specific cost which

is the minimum obligation incurred to secure the use of capital from a specific source.

Cost of Debt Capital

The cost of long-term loans and debentures is treated as the contractual interest rate adjusted in the light of tax liability. In order to calculate such cost we utilize the following formula:

$$K = (I - T)R$$

where,

K = the cost of debt capital,

T = the marginal tax rate, and

R = the contractual interest rate.

Since interest is deductable for purposes of evaluating tax liability it is customary to compute such cost as an after-tax effective rate of interest. The use of tax-adjusted rate of interest is justified when earning before interest and tax (EBIT) is equal to or exceeds the interest charges. In case of a negative EBIT rate the tax protection is not guranteed. The real cost of debt is usually higher than the contractual cost because of the increase in the rate of interest with the increase in debt finance and because of the hidden cost of borrowing that can be imputed from the fall in the

rate at which earnings on equity shares are capitalized. If it were not for these reasons, it would be hard to imagine that companies would ever finance their investment plans by any means other than debt.

The calculation of the cost of debentures is relatively easier because the interest paid on such items is precisely known. What we have to do is to relate the interest rate to the net proceeds obtained after substracting the cost of issue such as expenses involved in the issue of prospectus, brokerage etc. Suppose a company issues 10% debenture of $ 1,000 each repayble after 10 years and the costs of issue average 5%, thereby resulting in the receipts per debenture worth $ 950. Since the net amount received from a debenture is $ 950, but on maturity the amount to be paid is $ 1,000. The difference of $ 50 per debenture should, therefore, be set aside over the 10 year period at the rate of $ 5 per debenture per year. The total annual cost of the debenture would, therefore, be $ 100 + $ 5 rather than $ 100. According to the conditions of the debentures since the firm has to pay actual interest each year it would hold $ 5 set aside each year over the period of 10 years. The company would, therefore, use $ 975 instead of $ 950. The cost of debt capital, therefore, comes out

to be, $\frac{105}{975.00}$ = 10.76%. The formula for calculating the cost of debenture is:

$$Cd = \frac{i + \frac{VM - NP}{n}}{\frac{VM + NP}{2}}$$

where,

Cd = cost of debentures

i = annual interest payment

VM = value to be paid on maturity

NP = net proceeds, and

n = number of years after which the debenture has to be paid. Using the above formula to our case we get,

$$Cd = \frac{100 + \frac{1000 - 950}{10}}{\frac{1000 + 950}{2}}$$

$$= \frac{1000 + 950}{975}$$

$$= 10.76\%$$

The formula we have given is for the before-tax cost of debt capital. To find out the after-tax cost the following adjustment in the formula has to be made:

After-tax cost = Before tax cost (1 - Tax Rate).

Suppose the rate of corporate tax is 50% , then in that case the after tax cost of debentures would be as under:

10.76% (1 - 0.50)

= 10.76 (0.50)

= 5.38%

In the above example we have assumed that the debentures were issued and repayed both at par value. Even if such debentures are issued at a premium or at a discount and are repayable at par, the same formula can be applied effectively.

The Cost of Preference Share Capital

The technique of calculating the cost of preference shares is similar to that used for debentures. If 12% preference share (par value ₹ 100) is sold at ₹ 111 and the issue expenses incurred amount to ₹ 1 per share, the cost of such share would be:

$$\frac{\text{Obligations incurred}}{\text{Proceeds received}} = \frac{10}{111 - 1} = \frac{10}{110} = 9\%$$

Preference shares are a potent source of capital. They are either redeemable or irredeemable. There is a significant difference in the interest on debentures and

the dividends on preference shares. Interest on debentures is deductible for purposes of taxable income but no such deduction is permitted in case of dividend for preference shares. Thus while the interest on debt capital is the before-tax cost concept, the dividend cost in case of such shares is the after-tax cost item. It is, therefore, essential to find out the before-tax cost rather than after-tax cost of preference share capital. Suppose a preference share costs $ 100 with a dividend rate of 10% and its costs of issue is 5% resulting in the net proceeds of $ 95. If the preference shares are to be redeemed after 10 years, the after-tax cost of such share capital can be calculated as under:

$$C_p = \frac{PD + \frac{VM - NP}{n}}{\frac{VM + NP}{2}}$$

where,

C_p = cost of preference share capital,

PD = annual preference dividend,

VM = amount of value on maturity,

NP = Net proceeds,

n = number of years after which the preference shares are to be redeemed.

Using the above formula, we get:

$$C_p = \frac{10 + \frac{100 - 95}{10}}{\frac{100 + 95}{2}}$$

$$= \frac{10.5}{97.5} = 10.76\%$$

Assuming the tax rate of 50%, the before-tax cost would be:

$$10.76 \left(\frac{1}{1 - 0.50}\right) = 10.76 \left(\frac{1}{0.50}\right) = 21.52\%$$

If the shares are irredeemable or redeemable in the remote period of time, the excess of the maturity value over the net proceeds can be ignored.

In that case the cost of preference share would be calculated by relating the preference dividend to the net proceeds with the help of the following formula:

$$C_p \text{ (After-tax)} = \frac{PD}{NP}$$

where,

PD = preference dividend value, and

NP = net proceeds.

Applying the above formula, we get:

$$\frac{10}{95} = 10.52\%$$

For finding out before-tax rate the above ratio can be converted by applying the before-tax formula as follows:

$$10.52 \left(\frac{1}{1 - 0.50}\right) = 21.04\%$$

Cost of Equity Capital

The calculation of equity capital is tedious. It raises a host of problems. Since the basic aim of the management is to serve the best interest of the equity holders management try to maximise the present value of the equity owners' holdings with a view to increase the net present value of their wealth. This effort involves many decisions in respect of capital expenditures and financing.

There are four basic approaches for calculating the cost of equity capital: (1) D/P (Dividends/Price) Ratio; (2) E/P (Earnings/Price) Ratio; (3) D/P+G (Dividend /Price plus Growth Rate of Earnings); and (4) Realised Yield Approach.

D/P Ratio Approach

This approach is based on the philosophy that yield so obtained is what the investors except when they

invest their savings in a company. It signifies that the investor approaches at a market price of a share by capitalizing an array of dividend payments which are fixed at a given level. This approach ignores the fact that the shareholder obtains growing stream of dividends while he holds the shares and capital gain or loss when the share is sold. This technique is based on wrong presumption that the company will not earn on its retained earnings and that such earnings will result in neither an increase in dividends nor an appreciation of market price.

E/P Ratio Approach

The advocates of this approach assume that shareholders capitalize a flow of unchanged earnings by the capitalisation rate of earnings/price in order to evaluate their holdings. They, however, differ on the use of earnings figure and market price. Few utilize the current earnings in current market price for estimating the capitalisation rate while others rely on an average of earnings as well as of the price over the past periods. The selection of the market price to which the expected earnings are to be related involve value judgment. This approach has certain limitations. Firstly,

it ignores the fact that all earnings are not received directly by the shareholders in the form of dividends. Secondly, it is based on the falls premises that earnings per share remain constant and lastly, it is wrong to assume that share prices will remain constant because shareholders expect gains in the value of their shares as a result of the investment of the retained earnings.

D/P+G Approach

Shapiro, Gordan and Soloman are the proponents of this approach. It stresses on what the investors actually receive in the shape of dividends and the rate of growth in dividend. The growth rate in dividend is presumed to be equal to the growth rate in market price per share and the growth rate in earning per share. For example, if the earnings per share grow at a rate of 11% per annum and if dividends are a constant function of these earnings, then the growth rate on dividends per share is equal to growth rate in earnings per share. If the future price earnings ratio coincides with the current price earnings ratio and earnings as well as dividends accumulate at the same rate, the approach provides an accurate estimate of the return which the shareholders actually will receive. If these assumptions

are removed it will affect the validity of the approach. This approach has an edge over the E/P approach in view of the fact that it relies exclusively on relatively current data and future estimates. But it fails to determine the rate of growth of price appreciation expected by the shareholder when he is willing to pay a certain price for a current dividend.

Realised Yield Approach

Since the estimation of rate of return for future dividends and sale price are uncertain, this approach considers the rate of return actually realised for a period of time as a better guide to determine the cost of capital. The advocates of this school suggest that past behaviour will materialise in the future and the historic realised rate of return would, therefore, be an appropriate indicator of future rate of return. The realised yield may vary if purchases are made in good or bad times. But if the company does not change with respect to risk and the rate of return also remains stable over time, we can safely conclude that past rates will continue in future too. In order to determine the cost of equity capital, it is necessary to classify companies on the basis of income, cyclical pattern and

growth trends. The market price of equity share in a company with stable income fluctuates less than that which is subject to cyclical changes. Cyclical companies pose a big problem because of high volatility of earnings. In such companies attempt should be made to find an average E/P ratio over the period of the cycle. The explicit cost of equity is generally very low in growth companies due to their high price earnings ratio. Equity holders in such companies are more concerned about capital appreciation than the immediate return. Investors expect that the earnings will grow rapidly thereby increasing market price and ultimately leading to substantial capital appreciation. The D/P+G approach is, therefore, suitable for such companies.

The above analysis thus suggest that every management should consider the interest of the existing equity holders. Such shareholders have atleast to be assured that their positions would not be adversely affected. This can be done only when the funds secured by the issue of new equity shares, if invested, yield atleast so much that the new earnings per share do not fall below the existing earnings. The cost of equity capital is essentially an imputed cost which is calculated by current earnings per share relating to the

current market price per share. Suppose the company's share, whose paid up value is $ 75, is being priced in the market at $ 110 and the earnings per share are $ 11, the earnings price ratio, therefore, would be 10%. If new shares are to be issued by the company, the fresh fund must, therefore, earn so much that the new earning per share is atleast $ 11. In that case the new share shall have to be quoted some what less than $ 110, the present prevailing price of the share to expedite the sale of new shares. For instance if it is priced at $ 105, its net proceed would be some what less the $ 105. If the costs of issue are 5% the net proceeds would amount $ 99.75. Since $ 99.75 should earn atleast $ 11, the imputed cost of capital would be approximately 11%. The formula for finding out the cost of equity capital is as under:

$$Ce = \frac{EPS}{NP} \times 100$$

where,

Ce = the cost of equity capital,

EPS = the minimum earnings on a new share,

NP = net proceeds per share.

Applying the above formula, we get:

$$Ce = \frac{11}{99.75} \times 100 = 11\% \text{ approx.}$$

To convert this rate into an after-tax cost, we multiply it by $\left(\frac{1}{1 - \text{Tax-rate}}\right)$. Since we have assumed 50% tax rate, we obtain before-tax cost as follows:[10]

$$C_e \text{ (before tax)} = 11 \left(\frac{1}{1 - 0.50}\right) = 22\%.$$

Cost of Retained Earnings

It is a mistaken view to treat retained earnings as cost free. This view is based on the assumption that shareholders and the company are two separate entities and that it costs nothing to the company to withhold the earnings from the equity holders. In fact these earnings have a cost which is equal to the cost of reinvested profits to shareholders or is equal to the rate of return that the shareholders can obtain by investing the after-tax dividends in alternative channels of equal opportunity. If earnings are paid as dividends and simultaneously the shareholders are allowed to buy new shares such shareholders would be subject to a tax and would be able to subscribe only an amount equal to $(1 - t)D$, where t stands for the marginal tax rate for individuals and D stands for dividends. To be equally well-off it is necessary that the value of

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10. See Varshney, R.L. & Maheshwari, K.L. Managerial Economics, pp. 227-235.

the shares of the individual shareholder rises by an amount, which after making necessary adjustments for any tax on capital gains, is equal to the net dividend the individual would have earned after-tax. The cost of retained earnings, therefore, can be expressed as:

$$\frac{(1 - t_i)D}{(1 - t_c)P}$$

where,

t_i = marginal income tax,

t_c = capital gains tax,

D = dividends, and

P = market price of the share.

Suppose a company is offering a dividend of $ 1 per share and its shares yield 10% at a market price of $ 10, then the required rate of return for the shareholder in the 70% tax bracket subject to a capital gains tax rate of 30% would be:

$$\frac{(1 - 0.70)1}{(1 - 0.30)10} = 4.28\%$$

However, for a shareholder in the 20% tax bracket subject to a 10% capital gains tax, the required return would be:

$$\frac{(1 - 0.20)1}{(1 - 0.10)10} = 8.89\%$$

For the non-taxable shareholder, the minimum required return would be the full 10%. It may therefore be emphasised that the cost of retained earnings is the function of personal income tax rates of its shareholders. The multiplicity of the shareholders' tax rates makes the application of this technique difficult, since in a public limited company there are numerious shareholders of various means and incomes for whom there can hardly be a single tax rate that would reflect the imputed cost of retained earnings to each and every shareholder. The management has to exercise the subjective judgment which is quite difficult.

Some financial analysts do not deem it fit to adjust the market capitalisation rate for the tax liability of the shareholders and suggest that the cost of retained earnings should be same as the market rate of capitalisation for the equity holders. They maintain that the cost of retained earnings is the opportunity cost to the company and not to the shareholder and hence it does not appear appropriate that management should consider the tax liability of its shareholders.

Cost of Depreciation Funds

Funds derived through depreciation are quite

useful in financing the capital projects. At the outset they may appear to be costless but they are not. Theorists believe that the cost considerations that are relevant to retained earnings should also apply to the depreciation funds. Essentially the cost of depreciation funds should be equal to their opportunity cost to the equity holders. When an internal project fails to earn atleast the rate that the equity holders can earn from outside investment, money should be utilized as a partial liquidating dividend and the company should start a programme of gradual dissolution.[11]

Average Cost of Capital Funds

One procedure for determining the cost of capital is to take a weighted average of the cost of each type of financing equity, preferred stock, bonds, retained earnings and other sources of funds. For calculating such capital we have to make certain assumptions regarding the capital structure of the company. For convenience sake we assume the following hypothetical structure company:

Equity Capital	30 per cent
Preference Shares	10 per cent
Debt Capital	40 per cent
Retained Earnings	20 per cent

11. See Kuchhal, S.C. Corporation Finance Principle and Problems, pp. 152-159.

So far we have calculated the following costs for each types of capital:

Types of Capital	After Tax	Before Tax
Equity capital	11%	22%
Preference shares	10.76%	21.52%
Debt capital	5.38%	10.76%
Retained earnings	5.23%	17.6%

In the light of these statistics it is possible for us to calculate the average cost of capital as under:

Average Cost of Capital

Table-1

Types of Capital	Proportion in the Capital Structure(X)	Before Tax Cost of Capital(Y)	XY
Equity Capital	30	22.00	660.00
Preference Shares	10	21.52	215.20
Debt Capital	40	10.76	430.40
Retained Earnings	20	17.60	352.00
	$\leq X = 100$		$\leq XY = 1657.60$

$$\text{Before-tax Capital} = \frac{XY}{X} = \frac{1657.60}{100} = 16.58\%$$

After-tax Capital = Before-tax Cost (1 - Tax Rate)

= 16.58 (1 - 0.50) = 8.29%.

This average cost of capital gives us a measure of the minimum rate of return which the new investment must earn in order to become acceptable.

The Optimum Capital Structure of the Company

As can be seen from the above examples, the cost of capital of a company depends upon its capital structure and hence it is possible to minimize such cost by changing the capital structure. This can be done either by depending too much on the low cost debt capital or upon equity capital or on equity and preference shares. Let us suppose that there are two companies X and Y both with a total capitalisation worth $ 5,00,000 but with different capital structures. Company X depends more on equity capital whereas company Y depends more on debt capital. Company X possesses $ 3,00,000 of equity capital and $ 2,00,000 of debt capital. As against this company Y has $ 2,00,000 of equity capital and $ 3,00,000 of debt capital. We further assume that equity capital is divided into shares of ₹ 100 each and the companies earn 20% before-tax and pay interest on debt at the rate of 10%. The following table shows the relative position of these two companies with reference to average cost of capital.

Table - 2

Particulars	X	Y
Equity Capital	3,00,000	2,00,000
Debt Capital	2,00,000	3,00,000
Earnings before interest & Tax	1,00,000	1,00,000
Interest @ 10%	20,000	30,000
Profit Before tax	80,000	70,000
Tax @ 50%	40,000	35,000
Profit After tax	40,000	35,000
Earning Per Share	13.33	17.50
Average Cost of Capital (After tax)	8.00	7.00

Thus the average cost of capital in case of company X is 8% after tax and for Y it is 7%. As can be see, the earnings per share is higher for company Y which relies more on debt capital and low in case of company X which depends more on equity capital. The main factor behind this is that the advantage of tax deductibility of interest gives company Y an opportunity in terms of lower tax liability and higher after tax profits. The use of bonds and preferred shares as media for acquiring long term capital is known as trading on equity. The advantage of trading

on equity lies in the fact that it increases the earnings per share for the equity holders. This never means that the companies should keep the proportion of their debt capital at the higher level for there are certain constraints imposed on the company to be highly geared. Firstly, there is a limit beyond which a firm can not borrow without much risk. Secondly, the shareholders would not allow the management to adopt this extreme step in view of riskiness of the step. Management, therefore, strikes a balance. They try to accumulate enough debt so as to give shareholders the opportunity of borrowing at low interest rates. At the same time they strive not to have so much debt that dividends are in danger if earnings fall. "Thus, given the firm's capital structure, management will undertake new financing in that medium-debt or equity-which is least costly, so that there will exist, or tend to exist, and equality between marginal (real) cost of borrowing and the marginal cost of equity."[12]

Determinants of Capital Cost

Capital costs are determined by a number of forces that exert their influence on the capital markets. Since

12. Spencer, Milton H. Op. cit. p. 426.

these forces do not act in the same direction, it is not always easy to explain the net effects as well as the direction of new and long term changes. The single most important determinant of the interest rate structure is the government that makes itself felt through its various policies. The government in which is vested the responsibility for pursuing monetary and credit policies aimed at promoting economic growth and stability, actually decides the pattern of rates that prevail in the market. Through exercising control over reserve requirements, rediscounting facilities and selective credit controls, the government can significantly affects the general level of rate structure. Open market operations policy itself is a significant tool designed to shape the costs of debt capital. Besides this the government bond market is almost entirely within the purview of the government itself. The manner and direction in which these forces are applied is indicative of the fact that government possesses enough potentials to shape the cost of capital.

Public psychology frequently points in the same direction. Consumer optimism, investor's confidence and business outlook are the most frequently felt areas

which affect the yields on security issues. The single most decisive factor for the pre-tax cost of equity capital has been the corporate income tax. There exists a significant correlationship between the corporate tax rate and the pre-tax cost of equity capital. In addition to these market forces there are certain other forces that effect the individual investment and are subject to specific stress and strain. For example, the decision to raise the rate of taxation on raw cotton can be expected to effect cotton textile industry or those concerns that are involved in this segment of the economy. Similarly if the outlook of certain industry is unpromising, the yields on the securities of the companies involved will reflect this fact. In short it may be suggested that many of the factors can be found to apply at times to specific companies rather than to industry in general. Element of uncertainty is another important force which should not be ignored. Yields on securities are lower if they are subject to less default. Money rate bonds that are relatively riskier offer higher yields in comparison to those that are less risky.

Cost of capital thus varies with company's soundness and prevailing conditions of the security

market. It differs from industry to industry and fluctuates violently. Estimation of cost of capital, therefore, requires determination of market value of securities, capital structure and cost of flotation. Besides this company policy on plough back, the level of the market at the time of issue, size of issues, amount raised and market frame of companies are the factors that exert a powerful influence on the cost of capital.

Rationing of Capital

So far we have analysed demand and supply for capital. We are now in a position to put demand and supply together for appraising individual capital expenditure proposals in what may be called rationing of capital. Theoretically the intersection point for the firm's demand schedule and capital supply schedule would indicate the desired volume of investment to be undertaken All projects offering a return in excess of the intersection rate should be accepted; those with estimates rates less than the critical one should obviously be rejected. The approach appears to be quite near but it is not readily useful for solving practical problems. The reason is that it is difficult to discover a uniquely determinable capital supply schedule that will intersect

the demand schedule at always the same point, which could then be treated as the cut off rate. It appears to be an arbitrary over simplification of the case to achieve a demand - supply equilibrium at cut off rate, since the firm's demand and supply schedules are conditioned by a vast complex of factors over which the firm has little control. Practical wisdom requires not only a ranking of projects according to the magnitude of profitability but also a rejection standard to separate projects that are not sufficiently profitable to merit the allotment of funds. The rejection rate helps to weed out projects that have too low profitability and aids in implementing long-run capital budgeting plans that seek to avoid making marginal investments of low productivity in periods of declining demand. Theoretically cut-off rate is determined exogenously but rejection rate is set administratively.

Conceptually four forms of rejection rates of return can be foreseen: (1) the minimum rate, which is stable; (2) the effective rate, which fluctuates above the minimum; (3) the long run rate, which is alternative to the plan that combines effective and minimum rates; and (4) the exception rate, which serves as differential handicaps for categories of investment that need unusual

rejection standards because of variations in measurability of risks.[13] Since the basic aim of the firm is to maximize its long-run profit potentials, it should select those projects that are not only profitable but are most profitable. Ordinarily the capital required for various investment opportunities exceeds the available supply of capital. Thus it is not enough for management to identify investment opportunities as profitable. In addition, they should be ranked according to their relative profitability. This means that not all profitable investment opportunities should be accepted, but those opportunities should be chosen that not only yield a rate of return in excess of the cost of capital but are relatively more profitable.

Post Audit

Predicting future events without comparing the predictions to the events as they unfold is like playing basket-ball with no players in the field except a referee. In either case no one will know what the score might actually be. Like a game, budgeting looses its zest unless the management can observe the results of their

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13. Dean Joel, Op. cit. p. 599.

foresight. When a project has been completed, an audit of the actual savings realised and the actual return on investments is essential. This task is carried out in budgeting department by industrial engineers, cost accountants and operating personnel. The actual savings realised are incorporated in current product-cost and departmental cost budgets, if cost reduction occurs, or in appropriate sales budget if improvement in quality or increase in production results. The post-competition audit thus ties in the actual results of each project not only with the capital-budget estimates on the basis of which it was planned, but also with the current operating budgets which the savings are intended to improve.[14]

A post audit helps management to gain experience by noting the variations between events and their predictions and by looking for assignable factors in such variations. Furthermore, it helps to eliminate irresponsible predictions for the obligation to face future comparisons is a strong deterrent to making irresponsible predictions. The auditing process requires setting up the suitable accounting system for establishing

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14. Knight, W.D. & Weinwurm, E.H. Managerial Budgeting (New York, The Macmillan 1964) p. 275.

cost-accounting points around which the data may be collected. Where items are too small to justify the effort they may be omitted from the purview of audit, but as long as budgeting is being done, the expense of providing the accounting figures needed for such an audit is in itself a good investment.

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